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Deaths from lung cancer and ischaemic heart disease due to passive smoking in New Zealand

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Abstract

Passive smoking is increasingly recognised as a public health hazard. Among New Zealanders who have never smoked, the prevalence of exposure to spousal smoking has been estimated to be 12.7% for men and 16.1% for women. The prevalence of exposure to passive smoking in the workplace has been estimated to be 33.6% and 23.4% for never smoking men and women respectively. The pooled risk estimates from epidemiological studies of the health effects of passive smoking were used to estimate the numbers of deaths from lung cancer and ischaemic heart disease attributable to passive smoking in New Zealand in 1985. The pooled relative risk estimates for lung cancer mortality were 1.3 (95% confidence interval (CI): 1.1-1.5) in both men and women exposed to passive smoking at home, and 2.2 (CI 1.4-3.0) in both men and women exposed to passive smoking at work. Using these relative risk estimates, it was calculated that 30 lung cancer deaths (range: 11-41) were attributable to involuntary smoking in New Zealand in 1985.

From pooled relative risk estimates of ischaemic heart disease death of 1.3 (CI 1.1-1.6) and 1.2 (CI 1.1-1.4) for exposure to spousal smoking in men and women respectively, it was estimated that a further 91 ischaemic heart disease deaths (range: 39-177) were due to passive smoking at home. The number of ischaemic heart disease deaths due to passive smoking in the workplace was even higher, at 152 (range: 62-224), assuming relative risks of 2.3 (CI 1.4-3.4) and 1.9 (CI 1.4-2.5) for men and women respectively.

The total number of deaths due to passive smoking from lung cancer and ischaemic heart disease was therefore estimated to be 273 per year (range: 112-442).

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Introduction

Recent reviews have concluded that exposure to passive smoking is harmful to health [1-4]. The effects of passive smoking on health have been reported to include acute effects, such as exacerbation of asthma and angina, as well as chronic effects such as the increased risk of upper and lower airways infection in children and the increased risk of lung cancer in adults [4].

The association of lung cancer with passive smoking appear to satisfy epidemiological criteria of causality [5,6]. To date 13 studies have been completed in six countries, 10 of which have reported a positive association between lung cancer and passive smoking [6]. Three studies have failed to show an association [7-9], but in each study the precision of the effect estimates was such that an increased risk could not be ruled out. Publication bias, ie, bias which occurs when papers with nonsignificant results are either not submitted or accepted for publication, has been put forward as an explanation for the association between passive smoking and lung cancer [10]. However, this claim has been criticised and discredited [11]. More recently, evidence has begun to accumulate which implicates passive smoking in the development of ischaemic heart disease [12-14].

Passive smoking is therefore a potentially important public health problem in New Zealand, and it is desirable to assess the magnitude of the problem. Taking the relative risk estimates reported in epidemiological studies and applying them to estimates of the proportion of the New Zealand population exposed to passive smoking, we have made a preliminary estimate of the impact of passive smoking on the health of nonsmokers.

We here report estimates of the numbers of deaths from lung cancer and ischaemic heart disease attributable to prolonged exposure to passive smoking in New Zealand in 1985. The evidence of excess deaths from other causes – ie, cancers of sites other than the lungs, and chronic respiratory disease – due to passive smoking is more tenuous [2]. Death from these causes has therefore not been considered here.

Statistical methods

The proportion of deaths from a particular disease attributable to a specific exposure is known as the population attributable risk (also referred to as the aetiologic fraction).

If p is the proportion of the general population exposed to the risk factor (in this case involuntary smoking) and RR is the relative risk of dying of the disease in exposed versus nonexposed individuals, then the population attributable risk is given by [15]:

$$PAR = \frac{p(RR-1)}{p(RR-1)+1}$$

This measure has been used in many previous studies, including two studies which estimated the proportion of deaths in New Zealand attributable to active smoking [16,17], as well as in a Canadian study which estimated the proportion of lung cancer deaths attributable to passive smoking [5].

In the current study, the relative risk estimates from overseas studies were applied to New Zealand data on passive smoking exposure, and the derived population attributable risks were then applied to lung cancer and ischaemic heart disease deaths in 1985 among persons who had never smoked [18]. The population attributable risks and deaths attributable to passive smoking were estimated separately for men and women, and for exposure at home and at work.

Estimation of exposure to passive smoking

Estimation of exposure to passive smoking at home: Estimates of the prevalence of exposure of never smokers to passive smoking at home were obtained from the Auckland heart study (work in progress). The study found that 12.7% of never smoking men and 16.1% of never smoking women aged 35-64 years in Auckland in 1987-88 were exposed to passive smoking in their homes. These figures are not limited to exposure to spousal smoking, but include exposure to all

other sources of passive smoking within the household. On the other hand these figures are likely to underestimate the effects of long term exposure to spousal smoking, since we have not taken account of never smokers who have been previously exposed to passive smoking, but are currently widowed, separated, divorced, or living with exsmokers.

Estimation of exposure to passive smoking in the workplace: The prevalence of exposure to passive smoking in the workplace was also obtained from the Auckland heart study. In this study, 33.6% and 23.4% of never smoking men and women, aged 35-64 years in Auckland in 1987-88, were exposed to passive smoking at work. A recent random telephone survey of the Wellington region reported that the proportion of nonsmokers exposed to passive smoking in the workplace may be even higher, reaching up to 80% [19]. However a significant proportion of the respondents reported that most of their exposure occurred during tea and lunch breaks. Therefore we adopted the more conservative prevalence estimates.

Estimation of relative risks associated with exposure to passive smoking

Estimation of the relative risk of lung cancer due to passive smoking at home: The relative risk of dying of lung cancers in never smokers exposed to spousal smoking was obtained from the pooled results of 10 case control studies and two prospective studies [20]. The relative risk of lung cancer mortality in women who had never smoked and who were married to ever smokers, weighted by the Mantel-Haenszel procedure, was 1.3 (95% confidence interval: 1.1-1.5) [20]. There have been few studies of lung cancer among men who have never smoked. We have assumed, as others have done [8], that the relative risk of lung cancer in never smoking men married to ever smoking women is the same as for never smoking women married to ever smoking men (Table 1).

Table 1. — Estimates of relative risk of deaths from lung cancer and ischaemic heart disease due to passive smoking (95% confidence interval)

Disease	Relative risk from exposure at home		Relative risk from exposure at work	
	Men	Women	Men	Women
Lung cancer	1.3 (1.1-1.5)	1.3 (1.1-1.5)	2.2 (1.4-3.0)	2.2 (1.4-3.0)
Ischaemic heart disease	1.3 (1.1-1.6)	1.2 (1.1-1.4)	2.3 (1.4-3.4)	1.9 (1.4-2.5)

Estimation of the relative risk of lung cancer due to passive smoking in the workplace: The elevated lung cancer risk from passive smoking has been well established, but few studies have specifically examined risks from workplace exposures. Thus instead of using direct estimates, the relative risk for lung cancer death from exposure to passive smoking in the workplace was estimated via an exposure response relationship derived by Repace and Lowrey [6,21]. They estimated that the degree of exposure to passive smoking at home, at work, and at both sites, corresponded to respective daily inhalation of 0.45, 1.82 and 2.27 mg of the particulate phase of ambient tobacco smoke [6]. According to this model, exposure to passive smoking at work should result in a higher risk for lung cancer than exposure at home. Based on the relative risk estimate of 1.3 for home exposure (Table 1), the relative risk of lung cancer in persons exposed to passive smoking in the workplace was estimated to be 1+ (0.3 x 1.82/0.45), yielding a relative risk estimate of 2.2 (range: 1.4-3.0) (Table 1). This estimate is consistent with the relative risk of 3.3 (95% confidence interval: 1.0-10.5) for never smokers exposed to passive smoking at work reported by Kabat and Wynder [22], in one of the few studies that has distinguished exposure at work from exposure at home. However, we have adopted the more conservative estimate of 2.2 (Table 1).

Estimation of the relative risk of ischaemic heart disease death due to passive smoking at home: The estimates for the relative risk of ischaemic heart disease death in never smokers exposed to spousal smoking were obtained from Wells' pooled analysis of five cohort studies and two case control studies [23]. The pooled relative risk for men exposed to spousal smoke, weighted by the Mantel-Haenszel procedure, was 1.3 (CI: 1.1-1.6), and the corresponding estimate for women was 1.2 (CI: 1.1-1.4) [23].

Estimation of the relative risk of ischaemic heart disease death due to passive smoking in the workplace: There is at present scant data on the relative risk of ischaemic heart disease death due to passive smoking in the workplace. The study by Svendsen et al [13], based on data from the MRFIT trial, reported that the relative risk of coronary heart disease death in men exposed to coworkers' smoke compared with men whose coworkers did not smoke, was 2.6 [13]. However, the risk estimate was imprecise (CI: 0.5-12.7; p=0.23), and in addition, the MRFIT trial involved men who were at high risk of coronary heart disease at entry.

Nevertheless, a higher value for the relative risk of ischaemic heart disease death from exposure to passive smoking in the workplace compared to the home is consistent with the greater prevalence and intensity of exposure obtained in the former setting [6]. Using the same assumptions as in our calculation of the relative risk of lung cancer from passive smoking in the workplace, we estimated that the relative risk of ischaemic heart disease death from passive smoking in the workplace was 2.3 (range: 1.4-3.4) for men and 1.9 (range: 1.4-2.5) for women, respectively (Table 1).

Estimation of deaths due to passive smoking

There are a considerable number of uncertainties in the estimation of deaths due to passive smoking in New Zealand. These relate to uncertainties in the number of deaths in never smokers, the prevalence of exposure to passive smoking, and the relative risks due to passive smoking. The main uncertainty stems from the relative risk estimates. Accordingly, to provide a range of plausible values for the population attributable risks, the 95% confidence interval for the relative risk estimates (Table 1) have been used, and the other estimates have been regarded as fixed. Ranges have also been provided for the estimates of the number of deaths in never smokers (Tables 2-5) in order to give an indication of their precision, but these ranges have not been used in further calculations.

Estimation of lung cancer deaths attributable to passive smoking at home: In 1985 there were 1197 lung cancer deaths in New Zealand [18] — 866 in men and 331 in women. It was estimated from the cancer registry data that 8% of these deaths occurred in never smokers [24]. Therefore 69 male lung cancer deaths, and 26 female lung cancer deaths occurred in never smokers (Table 2).

Table 2. — Estimated number of deaths from lung cancer attributable to passive exposure to spousal smoke in New Zealand in 1985, by sex

	Men	Women
Total no of lung cancer deaths	866	331
% of people who had never smoked	8%	8%
No of lung cancer deaths in those who had never smoked	69	26
Prevalence of never smokers exposed to spousal smoking	12.7%	16.1%
Relative risk of lung cancer for exposure to spousal smoke (CI)	1.3 (1.1-1.5)	1.3 (1.1-1.5)
PAR, spousal smoke (range)	3.7% (1.3-6.0%)	4.6% (1.6-7.5%)
No of lung cancer deaths in never smokers attributable to spousal smoking (range)	3 (1-4)	1 (0-2)

PAR = population attributable risk

The population attributable risks were calculated to be 3.7% (range: 1.3-6.0%) for men, and 4.6% (range: 1.6-7.5%) for women (Table 2). The numbers of lung cancer deaths in 1985 attributable to passive smoking at home were therefore estimated to have been 3 (range: 1-4) for men and 1 (range: 0-2) for women, giving a total of 4 (range: 1-6).

Estimation of lung cancer deaths attributable to passive smoking in the workplace: Assuming a relative risk of 2.2, the population attributable risk for lung cancer deaths due to passive smoking in the workplace is 28.7% (range: 11.8-40.2%) for men, and 21.9% (range: 8.6-31.9%) for women (Table 3). The number of lung cancer deaths in never smokers attributable to passive smoking in the workplace is therefore estimated to have been 20 (range: 8-28) for men, and 6 (range: 2-7) for women, giving a total of 26 (range: 10-35) (Table 3).

The total annual number of lung cancer deaths attributable to passive smoking is thus estimated to have been 30 (range: 11-41), of which 87% is attributable to exposure in the workplace.

Table 3. – Estimated number of deaths from lung cancer attributable to passive smoking in the work place in New Zealand, 1985, by sex

	Men	Women
No of lung cancer deaths in never smokers	69	26
Prevalence of exposure to passive smoking in never smokers who work	33.6%	23.4%
Relative risk of lung cancer for exposure to passive smoking at work (CI)	2.2 (1.4-3.0)	2.2 (1.4-3.0)
PAR, work exposure (range)	28.7% (11.8-40.2%)	21.9% (8.6-31.9%)
No lung cancer deaths in never smokers attributable to passive smoking at work (range)	20 (8-28)	6 (2-7)

PAR = population attributable risk

Deaths from ischaemic heart disease attributable to passive smoking at home: Data on the proportion of ischaemic heart disease deaths occurring in never smokers in New Zealand were not available. We estimated this proportion by applying the relative risks of ischaemic heart disease death – obtained from the cohort study by Doll and Peto [25,26] – for each category of smoking (never smoked, exsmoker, smoking between 1-14, 15-24, and over 25 cigarettes per day) to the proportions of New Zealanders aged over 25 years in each category, based on the 1981 census data [27]. The proportions of never smokers among ischaemic heart deaths were then calculated as the percentage of all ischaemic heart disease deaths that would be expected to occur, based on these relative risks. It was thus estimated that 32.3% and 42.0% of ischaemic heart disease deaths occur in male and female never smokers, respectively. These figures are in close agreement with unpublished data from a coronary heart disease register in Auckland (Jackson R: work in progress).

The population attributable risks for ischaemic heart disease deaths in persons exposed to spousal smoke were estimated to be 3.7% (range: 1.3-7.1%) in men, and 3.1% (1.6-6.1%) in women (Table 4). The number of ischaemic heart disease deaths attributable to passive smoking in the home is estimated to have been 51 (range: 18-97) in men, and 40 (range: 21-80) in women, a total of 91 deaths (range: 39-177).

Table 4. – Estimated number of deaths from ischaemic heart disease attributable to passive exposure to spousal smoking in New Zealand, 1985, by sex

	Men	Women
Total no of deaths from IHD	4234	3106
% of people who had never smoked	32.3%	42.0%
No of people who had never smoked	1368	1305
Prevalence of exposure to spousal smoke among married never smokers	12.7%	16.1%
Relative risk of IHD for exposure to spousal smoke (CI)	1.3 (1.1-1.8)	1.2 (1.1-1.4)
PAR, spousal smoke (range)	3.7% (1.3-7.1%)	3.1% (1.6-6.1%)
No of IHD deaths in never smokers attributable to spousal smoking (range)	51 (18-97)	40 (21-80)

PAR = population attributable risk; IHD = ischaemic heart disease

Deaths from ischaemic heart disease attributable to passive smoking in the workplace: Since the risk of ischaemic heart disease from active smoking diminishes rapidly after cessation of smoking, it was assumed that the risk of ischaemic heart disease death from exposure to passive smoking in the workplace would similarly decline after withdrawal from the workforce. Furthermore, the estimates of workplace exposure used in this study (Tables 3 and 5) were based on data for Aucklanders aged 35-64 years. Thus, conservative estimates of ischaemic heart disease deaths due to exposure to passive smoking in the workplace were derived from the number of ischaemic heart disease deaths which occurred among those of working age, ie, those aged under 65 years. In this age group there were 1276 deaths in men and 366 in women in 1985 [18] (Table 5).

Table 5. – Estimated number of deaths from ischaemic heart disease attributable to passive smoking in the workplace in New Zealand in 1985

	Men	Women
Total number of ischaemic heart disease deaths in people aged <65 years	1276	366
% of people who had never smoked	32.3%	42.0%
Number of ischaemic heart disease deaths in never smokers aged <65 years	412	154
Prevalence of exposure to passive smoking in never smokers who work	33.6%	23.4%
Relative risk of ischaemic heart disease from exposure to passive smoking in the workplace (CI)	2.3 (1.4-3.4)	1.9 (1.4-2.5)
PAR, workplace exposure (range)	30.4% (11.8-44.6%)	17.4% (8.6-26.0%)
No of ischaemic heart disease deaths in never smokers attributable to smoking in the workplace (range)	125 (49-184)	27 (13-40)

PAR = population attributable risk

The population attributable risks for deaths from ischaemic heart disease due to passive smoking in the workplace, assuming relative risks of 2.3 for men and 1.9 for women, were 30.4% (range: 11.8-44.6%) in men, and 17.4% (range: 8.6-26.0%) in women. These yielded estimates of 125 (range: 49-184) ischaemic heart disease deaths in men, and 27 (range: 13-40) deaths in women, a total of 152 deaths (range: 62-224) (Table 5).

Discussion

The estimated total of 30 lung cancer deaths attributable to passive smoking represents 2.5% of all lung cancer deaths in 1985, and 31.6% of lung cancer deaths in those who had never smoked. These results are similar to previous estimates for USA [6] and Canada [5]. Repace and Lowrey estimated that passive smoking was responsible for 5% of the total annual lung cancer deaths, and 30% of the lung cancer deaths in never smokers in the USA [6]. Wigle and Collishaw estimated that in Canada passive smoking was responsible for 2.3% of the total annual lung cancer deaths, and 51% of lung cancer deaths in never smokers [5].

It is estimated that 243 deaths from ischaemic heart disease occurred in 1985 due to passive smoking. This represents 3.3% of all ischaemic heart disease deaths, and 9.1% of ischaemic heart disease deaths in never smokers. The total number of deaths in New Zealand in 1985 from lung cancer and ischaemic heart disease due to passive smoking was estimated to have been 273 (range: 112-442), of which 65.2% was attributable to exposure in the workplace (Table 6).

As we have stressed throughout, there are a number of uncertainties in these calculations, and the total of 273 deaths per year from lung cancer and ischaemic heart disease due to passive smoking should be regarded as only a preliminary estimate. Nevertheless it does indicate the likely magnitude of the mortality due to passive smoking in New Zealand. The findings of this study will need to be revised as more accurate data, particularly on the relative risks of diseases due to workplace exposure to passive smoking, become available.

However there are a number of reasons to suggest that the figures presented here are underestimates. Firstly, we have not considered the numbers of deaths attributable to passive smoking in two groups of nonsmokers: (1) never smokers who are not currently exposed to passive smoking at home (and in the case of ischaemic heart disease cases, at work), but who have been exposed in the past, and (2) exsmokers currently exposed to passive smoking. Secondly, we have not considered exposure to passive smoking in situations other than at home or at work, nor the impact of passive exposure to pipe or cigar smoking. Thirdly, we have not made adjustments to the relative risks for possible misclassification of exposures. In studies which have corrected for these biases [23,28], the net effect of the adjustment was to raise the relative risk estimates. Fourthly, we have not attempted to estimate the numbers of deaths from cancers of sites other than the lungs. Based on three cohort and two case control studies, Wells estimated that the relative risk of cancers other than the lungs in never smoking women exposed to passive smoking was 1.16 (95% confidence limits: 1.06-1.27) [23]. Excess cancers were observed for cancers of the breast, cervix, brain, paranasal sinuses and endocrine glands [23]. Although these studies have been criticised for their failure to control for risk factors known to be associated with cancers of these sites [2], it is nevertheless likely that at least some deaths from these cancer types are attributable to passive smoking. Finally, we have not attempted to estimate the numbers of pneumonia deaths attributable to passive smoking in childhood, nor the increased numbers of perinatal deaths associated with smoking during pregnancy [4].

Despite the uncertainties in the estimates presented here, they nevertheless suggest that passive smoking is a major public health problem in New Zealand. Although a more precise estimate of the number of deaths due to passive smoking must await further studies, there is a clear case for taking action on current evidence. The protection of the health of nonsmokers, particularly in the workplace and in enclosed public places, must be given priority as an issue of environmental health protection. It is encouraging that the necessary regulatory actions are beginning to occur.

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Congenital long QT syndrome in adults

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Abstract

A family with the Romano-Ward syndrome is presented. This family showed typical features of this syndrome with QT prolongation, torsades de pointes ventricular tachycardia, sudden death and an autosomal dominant inheritance pattern. The index case presented with an exacerbation of torsades de pointes ventricular tachycardia from diuretic induced hypokalaemia, and responded to diuretic withdrawal and beta blocker therapy.

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Introduction

Abnormalities of ventricular repolarisation predispose the heart to ventricular arrhythmias, typically polymorphic ventricular tachycardia (torsades de pointes). Abnormal repolarisation is typically represented on the surface electrocardiogram by QT interval prolongation. However T or U wave abnormalities may also reflect abnormal repolarisation. Abnormal repolarisation is usually acquired due to cardiac injury, metabolic derangement or drugs. Rarely, abnormal repolarisation is congenital and may occur either sporadically or as an autosomal recessive or dominant condition.

We present a family with autosomal dominant QT prolongation and torsades de pointes ventricular tachycardia.

The patient

The index case was a 44 year old female with a life long history of syncope which was usually precipitated by exertion or emotional stress. Three months prior to admission she was commenced on cyclopenthiazide 0.5 mg daily for hypertension. Since commencement of cyclopenthiazide she reported that the syncopal episodes became more frequent and prolonged. During one episode she was observed by her husband to be pale and pulseless. She had no other significant past history, and was on no other medications. On admission to hospital she was anxious but otherwise well. Blood pressure was 140/80 mmHg and general examination normal. Resting rhythm strip